

CLAIMS

What is claimed is:

1. A semiconductor package comprising:
 - 5 an image sensor die comprising:
 - a photo sensing surface, the photo sensing surface converting lights incident from an outside into electrical signals;
 - 10 bond pads formed around the photo sensing surface;
 - first conductive bumps formed at the bond pads;
 - 15 a non-photo sensing surface opposite to the photo sensing surface; and
 - side surfaces, each of the side surfaces formed between the photo sensing surface and the non-photo sensing surface;
 - 20 a substrate comprising:
 - an insulative layer comprising a window formed at an area corresponding to the photo sensing surface of the image sensor die, the insulative layer attached to the non-photo sensing surface of the image sensor die by a first adhesive;
 - 25 electrically conductive patterns formed at the insulative layer and connected to the first conductive bumps, the electrically conductive patterns extending over one of the side surfaces and the non-photo sensing surface of the image sensor die; and
 - 30 first holes formed at the insulative layer corresponding to the non-photo sensing surface so that the electrically conductive patterns are opened downward; and
 - 35 a glass attached to the insulative layer of the substrate by a second adhesive to cover the window.

2. The semiconductor package as claimed in claim 1, wherein solder balls are attached to the first holes of the insulative layer to be connected to the electrically conductive patterns.

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3. The semiconductor package as claimed in claim 1, wherein the first conductive bumps are encapsulated by an encapsulant.

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4. The semiconductor package as claimed in claim 3, wherein the encapsulant is located outside of the photo sensing surface of the image sensor die and between the image sensor die and the substrate.

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5. The semiconductor package as claimed in claim 3, wherein the encapsulant is made from under fill, glob top, or coating material..

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6. The semiconductor package as claimed in claim 1, wherein a first curved portion having a curvature is further formed at an area corresponding to the one of the side surfaces of the image sensor die.

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7. The semiconductor package as claimed in claim 1, wherein second conductive bumps are inserted into the first holes of the substrate and are connected to a first memory die.

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8. The semiconductor package as claimed in claim 7, wherein the substrate is attached to the first memory die by a third adhesive.

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9. The semiconductor package as claimed in claim 8, wherein the substrate has second holes formed at the insulative layer in an area corresponding to the first memory die so that the electrically conductive patterns are exposed downward, and solder balls are attached to

the second holes so that the solder balls are electrically connected to the electrically conductive patterns.

5 10. The semiconductor package as claimed in claim 1, wherein a lower surface of the substrate corresponding to the non-photo sensing surface of the image sensor die is attached to a first memory die by a third adhesive.

10 11. The semiconductor package as claimed in claim 10, wherein the first memory die is connected to the electrically conductive patterns by second conductive bumps.

15 12. The semiconductor package as claimed in claim 11, wherein the substrate has second holes formed in the insulative layer in an area corresponding to the first memory die so that the electrically conductive 20 patterns are exposed downward, and solder balls are attached to the second holes so that the solder balls are electrically connected to the electrically conductive patterns.

25 13. A semiconductor package comprising:
an image sensor die comprising:
a photo sensing surface, the photo sensing
surface converting lights incident from an outside
into electrical signals;
30 bond pads formed around the photo sensing
surface;
first conductive bumps formed at the bond
pads;
a non-photo sensing surface opposite to the
photo sensing surface; and
35 side surfaces, each of the side surfaces
formed between the photo sensing surface and the

non-photo sensing surface;
a substrate comprising:
an insulative layer comprising a window
formed at an area corresponding to the photo
sensing surface of the image sensor die;
5 electrically conductive patterns formed at
the insulative layer and connected to the first
conductive bumps, the electrically conductive
patterns extending over one of the side surfaces
10 and the non-photo sensing surface of the image
sensor die; and
first holes formed at the insulative layer
corresponding to the non-photo sensing surface so
that the electrically conductive patterns are
15 opened downward;
a glass attached to the insulative layer of the
substrate by an adhesive to cover the window;
a first memory die electrically connected to the
electrically conductive patterns; and
20 a second memory die electrically connected to the
electrically conductive patterns.

14. The semiconductor package as claimed in claim
13, wherein the non-photo sensing surface of the image
25 sensor die is attached to the second memory die by an
adhesive.

15. The semiconductor package as claimed in claim
13, wherein an upper surface of the first memory die is
30 attached to a third memory die by an adhesive, and the
third memory die is electrically connected to the
electrically conductive patterns.

16. A manufacturing method of a semiconductor
35 package comprising:
1) providing an image sensor die, the image sensor
die comprising:

a photo sensing surface, the photo sensing surface converting lights incident from an outside into electrical signals;

5 bond pads formed around the photo sensing surface;

conductive bumps formed at the bond pads;

10 a non-photo sensing surface opposite to the photo sensing surface; and

side surfaces, each of the side surfaces formed between the photo sensing surface and the non-photo sensing surface;

15 2) preparing a substrate, the substrate comprising an insulative layer having a window formed at an area corresponding to the photo sensing surface of the image sensor die, the insulative layer having electrically conductive patterns formed at a lower surface of the insulative layer;

20 3) aligning the photo sensing surface of the image sensor die with the window of the substrate, and then connecting the conductive bumps of the image sensor die to the electrically conductive patterns of the substrate;

25 4) interposing an adhesive surrounding the window and between the substrate and a glass, and then attaching the glass to the substrate so as to cover the window;

30 5) interposing an adhesive between the substrate and the non-photo sensing surface of the image sensor die, bending the substrate over one of the side surfaces and the non-photo sensing surface of the image sensor die, and attaching the substrate to the non-photo sensing surface of the image sensor die; and

35 6) fusing solder balls to a lower surface of the substrate corresponding to the non-photo sensing surface of the image sensor die so that the solder balls are electrically connected to electrically conductive patterns.

17. The manufacturing method as claimed in claim
16, further comprising connecting the image sensor die
to the substrate by the conductive bumps, and then
5 doping an encapsulant around the conductive bumps so
that the photo sensing surface is protected from an
outside environment.

18. The manufacturing method as claimed in claim
10 17, further comprising forming holes in the insulative
layer.

19. The manufacturing method as claimed in claim
18, wherein the solder balls are attached to the holes.
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20. The manufacturing method as claimed in claim
16 wherein bending the substrate over one of the
side surfaces and the non-photo sensing surface of the
image sensor die comprising forming a curved portion in
20 the substrate having a curvature preventing breaking of
the electrically conductive patterns.